

Range extension of *Pristimantis uisae* (Lynch, 2003) (Anura: Craugastoridae) in the Cordillera Oriental of Colombia

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Abstract

Pristimantis uisae is a poorly known frog species reported only from three nearby localities in the western slopes of the Cordillera Oriental of Colombia (Boyacá and Santander Departments). In this work, 12 new records for this species are provided, including the first published records of this species for Cundinamarca Department and from the Eastern slopes of the Cordillera Oriental. Additionally, the new localities reported herein increase its known elevation range to 2300–3050 m. Further studies are needed for having a better understanding of the distribution of *Pristimantis uisae*.

Key words

Amphibia; direct-developing frog; Terrarana; Andes; new records; distribution.

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Introduction

Pristimantis uisae (Lynch, 2003) is a poorly known species of frog endemic to the western slopes of the Cordillera Oriental of Colombia (Boyacá and Santander departments). This species was considered by Lynch (2003) as being closely related to 6 other species of *Pristimantis* [*P. angustilineatus* (Lynch, 1998), *P. baiotis* (Lynch, 1998), *P. brevifrons* (Lynch, 1981), *P. boulengeri* (Lynch, 1981), *P. dorsopictus* (Rivero & Serna, 1987), and *P. eremitus* (Lynch, 1980)] that inhabit the Cordillera Occidental and the Cordillera Central of the Colombian Andes, as well as the northwestern Andes of Ecuador and southwestern Colombia, and which are now considered as part of the *Pristimantis boulengeri* species group (with the exception of *P. eremitus*; González-Durán et al. 2017). However, Lynch (2003) did not provide any characteristic that supports the hypothetical close rela-

tionship of *P. uisae* with these other 6 species, and this species was not assigned to the *Pristimantis boulengeri* species group by González-Durán et al. (2017). Indeed, the phylogenetic relationships of *P. uisae* has never been evaluated, as it has not been included in any of the recent morphological or molecular-based phylogenies of the genus (e.g. Hedges et al. 2008, Hoyos et al. 2014, Rivera-Correa and Daza 2016). There are no publicly available DNA sequences for this species (no sequences in the Genbank database as of June 2017), and the only known aspects of its morphology are those listed in its original description (Lynch 2003).

At present, *P. uisae* is known only from 3 publications: its original description (Lynch 2003) and the ecological studies of Gutiérrez-Lamus et al. (2004), and Cortés et al. (2008). Gutiérrez-Lamus et al. (2004) found that this was one of the most abundant species of the frog assemblages in their study, being significantly more common in native

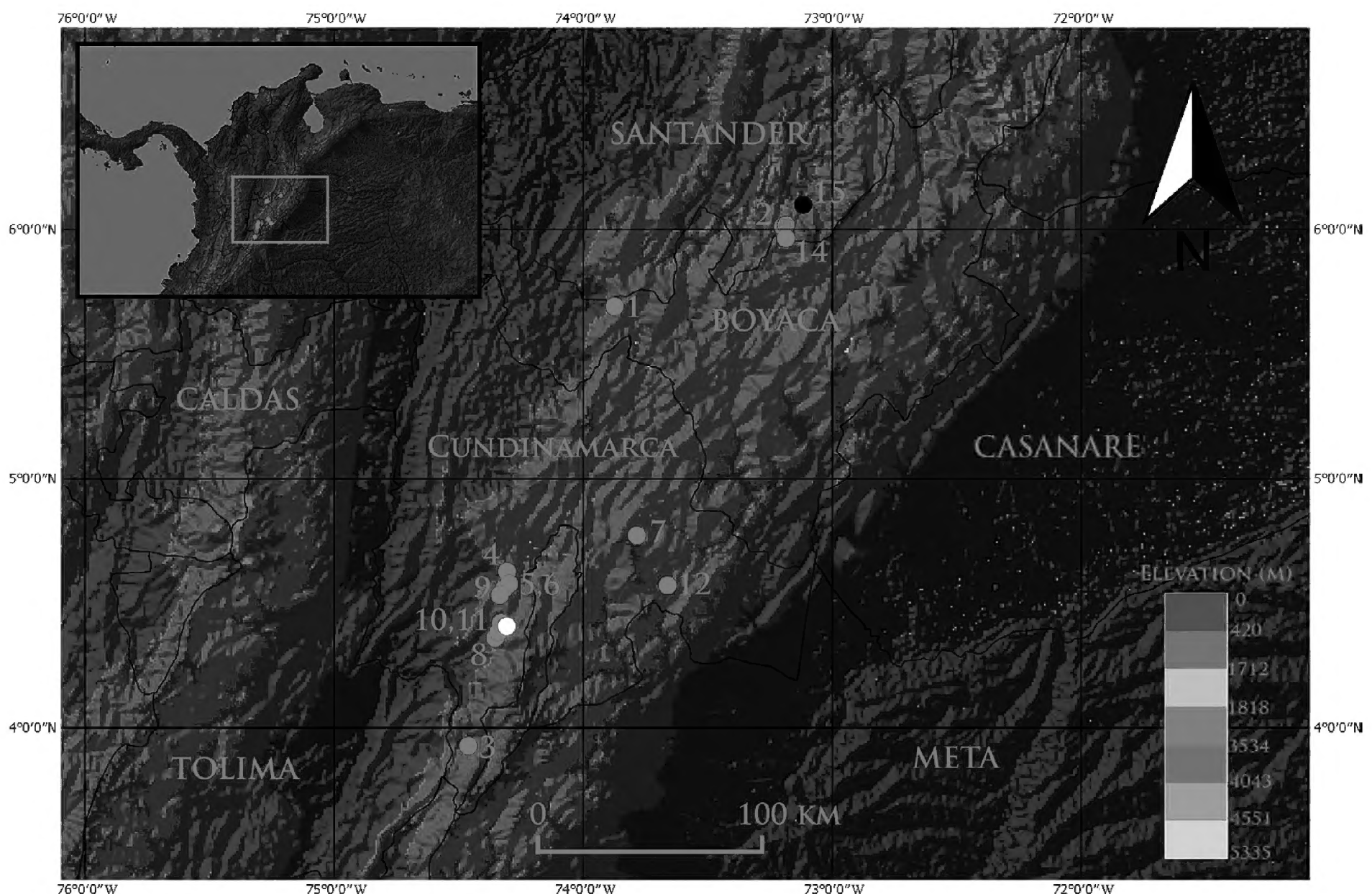


Figure 1. Map of the known localities of *Pristimantis uisae*, including the 12 new records reported herein. Each number corresponds to each locality in Table 1. Red dots indicate the new reports, whereas the yellow and blue ones indicate the type locality and the locality of the paratypes, respectively. The black dot represents the locality reported by Cortés et al. (2008), and the white dot, the unpublished record of Rueda-Almonacid (2010).

forests than in old oak plantations used for reforestation (*Quercus humboldtii*), while Cortés et al. (2008) found that this species was evenly found in the interior and edge of 2 fragments of oak forests. The studies of both Lynch (2003) and Gutiérrez-Lamus et al. (2004) were based on the type series of *P. uisae*, all collected in 2002 from 2 nearby localities in the northwestern slopes of the Cordillera Oriental of Colombia in the departments of Boyacá and Santander (Paipa and Charalá municipalities, respectively). On the other hand, the study of Cortés et al. (2008) was based on specimens found in a locality (Reserva Biológica Cachalú, Encino municipality, Santander) very close to the collecting sites of the other specimens. The possibility that this species exhibits a wider range of distribution has thought possible (Lynch 2004), although no new records have been published to date. However, in an unpublished report, Rueda-Almonacid (2010) documented *P. uisae* for the first time from Department of Cundinamarca but without giving voucher numbers of collected specimens that serve as the basis for his record. Also, the photographs shown by Rueda-Almonacid (2010) of 2 of these specimens do not allow for unambiguous identification.

As a result of a short field trip to Parque Natural Los Tunos, Municipality of San Antonio del Tequendama (Department of Cundinamarca), and the examination of museum specimens of *Pristimantis* housed on 2 amphibian collections (Instituto de Ciencias Naturales at the

Universidad Nacional de Colombia and Museo de Historia Natural ANDES at the Universidad de Los Andes, Bogotá), 12 new localities are added here to the previously known distribution of *P. uisae* (Fig. 1, Table 1).

Methods

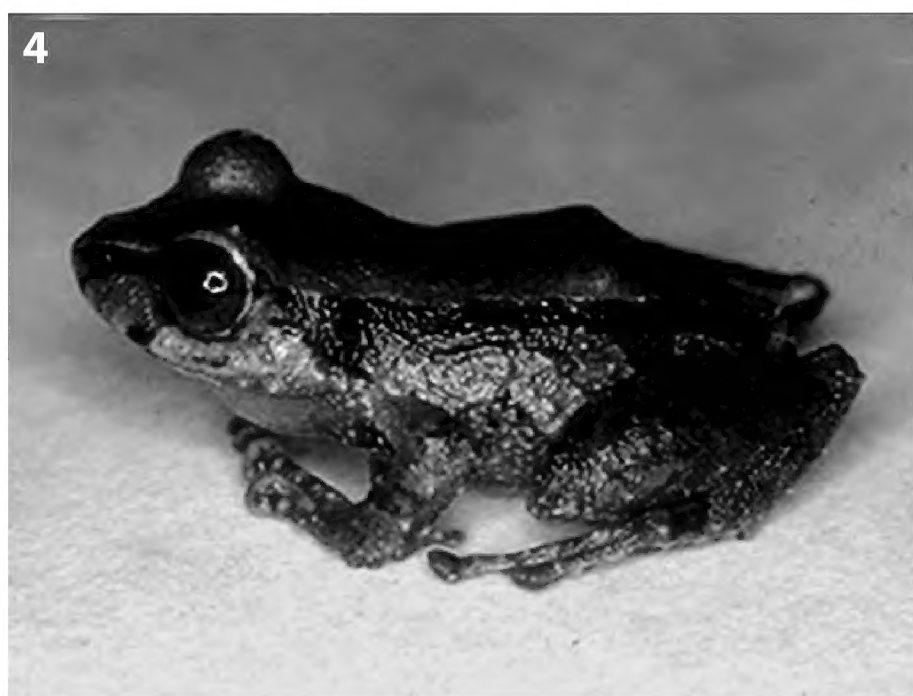
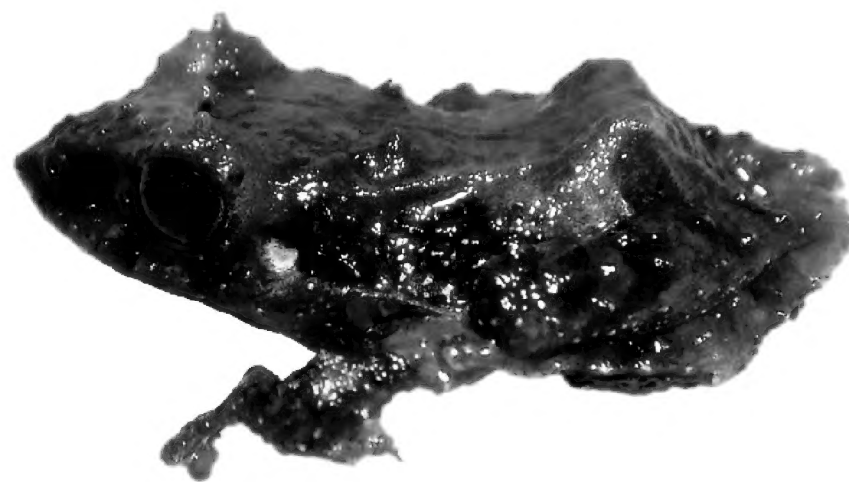
The first new record reported herein corresponds to 3 specimens (ANDES-A 2488–90) collected in Vereda Varela, Municipality of Chiquinquirá, Department of Boyacá (05°41'29.9" N, 073°52'24.1" W, ca. 2300 m altitude), about 83 km southwest (in a straight line) from the type locality of *P. uisae*. The following 8 records correspond to localities found in the western slopes of the Cordillera Oriental at the Department of Cundinamarca: 1 specimen (ICN 55895) from Quebrada La Esmeralda, Vereda Peñas Blancas, Municipality of Cabrera (03°55'40.3" N, 074°27'37.4" W, 2428 m), was collected about 30 cm above the ground on vegetation near Quebrada La Esmeralda (according to the data associated with the specimen); 8 specimens (ANDES-A 2479–2483 and 2484–2486) were collected in Vereda Canoas, Municipality of Soacha, Department of Cundinamarca (04°37'36.3" N, 074°18'19.9" W, ca. 2600 m), and 8 specimens were found on 14.4 km southwest of Sibaté, Quebrada Agua Bonita, Municipality of Silvania (04°25'16" N, 074°19'46" W, 2410 m). The last 8 specimens were found "sitting on vegetation in spray-zone of waterfall at night. Microsympatric

Table 1. List of all known localities of *Pristimantis uisae*, sorted by department. The datum was used for all coordinates is WGS84.

| Locality no. (in map) | Museum voucher | Departament | Municipality | Locality | Latitude (N) | Longitude (W) | Elevation (m) | Source | Remarks |
|--------------------------|---|--------------|----------------------------|--|-----------------|------------------|------------------|--------------------------------|---|
| 1 | ANDES 2488-90 | Boyacá | Chiquinquirá | Vereda Valera | 05°41'29.9" | 073°52'24.1" | ~2300 | This work | |
| 2 | UIS-A-5457, and specimens listed by Lynch (2003) | Boyacá | Paipa | Hacienda La Sierra, Santuario de Fauna y Flora Guanentá-Alto Río Fonce | 06°00'43.5" | 073°11'53.0" | 2700 | Lynch 2003, this work | Type locality |
| 3 | ICN 55895 | Cundinamarca | Cabrera | Vereda Peñas Blancas, Quebrada La Esmeralda | 03°55'40.3" | 074°27'37.4" | 2428 | This work | |
| 4 | ANDES-A 2479–2483, 2484–2486 | Cundinamarca | Soacha | Vereda Canoas | 04°37'36.3" | 074°18'19.9" | ~2600 | This work | |
| 5 | not collected | Cundinamarca | San Antonio del Tequendama | Parque Natural Los Tunos | 04°33'40.8" | 074°18'48.5" | 2340 | This work | |
| 6 | USNM 146691 | Cundinamarca | San Antonio del Tequendama | "Tequendama falls" | 04°34'39.3" | 074°17'48.8" | 2400 | Cochran & Goin 1970, this work | Tentative identification (see text) |
| 7 | ICN 55891, 55892 | Cundinamarca | Guasca | Vereda La Concepción, Reserva Natural Bioandina | 04°46'20.6" | 073°47'00.5" | 2992 | This work | |
| 8 | ICN 24461 | Cundinamarca | Fusagasugá | Vereda Agua Bonita, km 29 on the Sibate-Fusagasugá road | 04°21'36.4" | 074°21'13.3" | 2200 | This work | |
| 9 | ICN 825 | Cundinamarca | Soacha | Hacienda El Soche | 04°31'57" | 074°20'04" | 2620 | This work | |
| 10 | ICN 8307 | Cundinamarca | Fusagasugá | Km 25 on the Bogotá–Fusagasugá road, Finca La Primavera | 04°23'04.6" | 074°20'25.4" | 2410 | This work | |
| 11 | ICN 8308-8309, 23319-23324 | Cundinamarca | Silvania | 14.4 km SW of Sibaté, Quebrada Agua Bonita | 04°25'16" | 074°19'46" | 2410 | This work | |
| 12 | ICN 26159-26160, ICN 26165-26166 | Cundinamarca | Junín | Vereda Colombia, Reserva Biológica Carpanta | 04°34'18" | 073°39'37" | 2720, 3050 | This work | ICN 26159-26160 are from sector Sietecuerales in the same reserve |
| — | deposited on the herpetological collection of the Universidad Pontificia Javeriana (Bogotá, Colombia) | Cundinamarca | Fusagasugá | corregimiento La Aguadita, vereda Los Robles, finca La Carbonera | 04° 24' 27" | 074° 18' 23" | 2200–2600 | Rueda-Almonacid 2009 | Unpublished and unverified report |
| 13 | specimens listed on Lynch, 2003 | Santander | Charalá | Santuario Fauna y Flora Guanentá - Alto Río Fonce | 06°01'07.3" | 073°11'04.3 | 2400 | Lynch 2003 | Locality of paratypes |
| 14 | ICN 34245-34250 | Santander | Charalá | km. 38 on the Duitama–Charalá road, Hacienda La Sierra | 05° 57' 56" | 73° 11' 08" | 2400 | This work | |
| 15 | UIS-A 5526-5546 | Santander | Encino | Reserva Biologica Cachalú | 06°06'00.0" | 073°07'00.0 | 2000–2400 | Cortés et al. 2008, this work | |



3



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Figures 2–5. Specimens of *Pristimantis uisae* (Lynch, 2003) found in previously unreported localities. **2.** ICN 23319, an adult male from 14.4 km southwest of Sibaté, Quebrada Agua Bonita (Cundinamarca, Silvania). **3.** Uncollected juvenile specimen from Parque Natural Los Tunos (Cundinamarca, San Antonio del Tequendama). **4.** ICN 23320, an adult male from 14.4 km southwest of Sibaté, Quebrada Agua Bonita (Cundinamarca, Silvania). **5.** ICN 55891–55892, amplexing pair with eggs from Vereda La Concepción, Reserva Natural Bioandina (Cundinamarca, Guasca).

with *Eleutherodactylus* [now *Pristimantis*] *bogotensis*” (field notes of John D. Lynch, 20 June 1981). Photographs are available for ICN 23319 and 23320 (Figs 2, 4).

Additionally, 1 specimen each (ICN 825, 8397, and 24461, respectively) from the following three localities was found in the ICN collections: Hacienda El Soche, Municipality of Soacha (04°31'57" N, 074°20'04" W, 2620 m), km 25 on the Bogotá–Fusagasugá road, Finca La Primavera, Municipality of Fusagasugá (04°23'04.6" N, 074°20'25.4" W, 2410 m), and from Vereda Agua Bonita, km 29 on the Sibaté–Fusagasugá road, Municipality of Fusagasugá (04°21'36.4" N, 074°21'13.3" W, 2200 m). Also, an uncollected specimen of *P. uisae* was observed and photographed (Fig. 3) in Parque Natural Los Tunos, Municipality San Antonio del Tequendama, Department of Cundinamarca (04°33'40.8" N, 074°18'48.5" W, ca. 2340 m). The specimen was found in the distal part of a bromeliad leaf during day hours (ca. 12:08 a.m.). The plant was above a trunk found nearby to a creek at a height of 1.2–1.3 m above the ground.

Furthermore, examination of the photographs and description of USNM 146691 given by Cochran and Goin (1970: 426–427, pl. 53 G–I), collected [near] “Tequen-

dama falls, Municipality of San Antonio del Tequendama” (04°34'39.3" N, 074°17'48.8" W, 2400 m), suggests that it is probably another unreported specimen of *P. uisae*, as it is tentatively considered herein. This may also be the case for 3 additional specimens (USNM 146692–146694) collected at the same locality of USNM 146691 and which were also reported erroneously as the Central American species *P. cruentus* (but not illustrated or described) by Cochran and Goin (1970). However, without examining these specimens, a positive identification is not possible at this time, as they could be a different, sympatric species.

Two of the new records identified as *P. uisae* were collected in the Department of Cundinamarca but in the Eastern slopes of the Cordillera Oriental as follows: 4 specimens (ICN 26159–26160, ICN 26165–26166) were collected on Reserva Biológica Carpanta, Vereda Colombia, Municipality of Junín (04°34'18" N, 073° 39'37" W, 2720 and 3050 m), 2 additional specimens (ICN 55891, ICN 22892) were found in amplexus (Fig. 5) at 50 cm above the ground at about 9:10 p.m., in Vereda La Concepción, Reserva Natural Bioandina, Municipality of Guasca (04°46'20.6" N, 073°47'00.5" W, 2992 m). The female deposited a clutch of unfertilized eggs in the col-

lecting bag (M. Anganoy, pers. comm.), although many eggs remained in the body of the preserved female.

Finally, 2 specimens of *P. uisae* (ICN 34249, ICN 24250) found in the ICN collection were collected in a locality very close to the paratype locality on Santander Department: Municipality of Charalá, km 38 on the Duitama–Charalá road, Hacienda La Sierra (05°57'56" N, 073°11'08" W, 2400 m).

Results

All of the previously mentioned specimens were identified as *P. uisae* because they exhibit the following morphological characters that are diagnostic of the species (from Lynch 2003): snout pointed in lateral profile with a papilla on its tip, upper eyelid with at least one small conical tubercle, vomerine odontophores (when present, see below) oval and slanted, males with vocal slits and nuptial pads, a series of small tubercles present in the ulna and another one in the outer tarsi (both ulnar and outer tarsal tubercles being either round, subconical or conical, and even indistinct for the case of the outer tarsus of some specimens), a small round to conical heel tubercle (although in a few specimens it is only poorly defined), rounded subarticular tubercles, and a brown dorsum with darker markings, including labial bars beneath the eyes, as well as limb bars (Figs 2–5). Additionally, while examining the reported specimens it was noted that some specimens (including some paratypes) have a tubercle in the interorbital region, as well as one on each shoulder. These tubercles range from being absent to being conical (Figs 2–5), and they do not appear to be related to locality or sex. However, it was found that in general adult males and juveniles tend to be more tuberculate than females (Figs 2–5), and also that the degree of tuberculation is highly dependent upon the status of preservation of the ethanol-preserved specimens.

Furthermore, vomerine odontophores are lacking in many specimens, including most juveniles, irrespectively of their sex or their locality. Finding interspecific variability in the presence of vomerine odontophores in adults of *P. uisae* is unusual, as there are few *Pristimantis* species exhibiting this condition (G. González-Durán, pers. comm.). Further studies are needed in order to determine the reasons lying behind this variability, including the possibility that there are more than 1 species hiding under the name *P. uisae*.

The identification of most specimens was corroborated by Sandy Arroyo and John D. Lynch, experts on *Pristimantis* taxonomy at the Instituto de Ciencias Naturales, Universidad Nacional de Colombia. Additionally, the author examined and compared (directly or indirectly) the newly reported specimens to the entire type series of *P. uisae* (housed in the ICN and in the Colección de Anfibios, Museo de Historia Natural, Universidad Industrial de Santander, Bucaramanga, Colombia, UIS-A).

Discussion

The records of *Pristimantis uisae* reported herein include the first published records of this species from Cundinamarca Department, and they increase its altitudinal range from 2300 to 3050 m. The range of *P. uisae* is also extended approximately 272 km to the southwest (in a straight line) from this species' type locality, the northernmost known place where this species have been reported. As *P. uisae* was known only from 3 nearby localities, the records reported herein show that the species is much more widely distributed than previously thought (Fig. 1). All newly reported localities occur in well-preserved (at least at the time of collecting) humid montane forests.

These new records show that the scarcity of information of *P. uisae* since its original description is not due to its possible rarity and limited range, but to the lack of adequate study of the collections made in the localities where it is known or suspected to occur. In addition, the poorly known status of *P. uisae* is also caused by the paucity of collecting in several areas located between the known sites where this species has been found (e.g., the area near Muzo Municipality). Further collecting, as well as a detailed examination of the available specimens collected on these poorly known areas, is needed for better understanding the geographic range of *Pristimantis uisae*. Additionally, future studies need to evaluate the relationship of this species with the members of the *Pristimantis boulengeri* group of González-Durán (2017) and with the geographically close, and phenetically similar *P. petersi* (Lynch & Duellman, 1980), *P. tubernasus* (Rivero, 1984), *P. bogotensis* (Peters, 1863) and *P. lynchi* (Duellman & Simmons, 1978).

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